Course Description

Topologies are used to define continuous functions. This notion of continuity is quite general and extends the concept of continuity you have seen before for metric spaces. Althought the definition of a topology is very simple, the framework it provides is suprisingly powerful. In particular, a topology describes a set's "shape", both locally and in terms of its global structure.

There are two distinct branches of topology: point-set topology and algebraic topology. This course will contain elements of both braches (with my bias as a differential geometer influencing the material). We will start with basic concepts from point-set topology and spend some time with example topological spaces. Our eventual goal for the point-set portion of the class is to prove two deep theorems: Urysohn's Metrization Theorem which gives sufficient conditions for a topology to be derived from a metric, and Tychonoff's Theorem concerning the compactness of product spaces. The last third of the class will be devoted to elementary algebraic topology, a fascinating field that studies the relations between topological spaces and natural algebraic objects associated them. In this part of the class we will study homotopy theory, the fundamental group, covering spaces and the classification theorem of covering spaces.

Essential Information

Professor	David Maxwell
Office	Chapman 308C
Phone	474-1196
Email	`ffdam@uaf.edu`
Web	`http://www.math.uaf.edu/~maxwell`
Required Text	**Topology: a first course**, *James R. Munkres*, Prentice Hall
Optional Texts	**Counterexamples in Topology**, *Lynn Arthur Steen* and *J. Arthur Seebach*, Dover
	Introduction to Topological Manifolds, *John M. Lee*, Springer-Verlag

Prerequisites:

MATH F401-F402 (Advanced Calculus) **or** MATH F404 (Topology) **or** permission of instructor. It will be helpful if you have seen a bit of group theory before, but I will give a handout summarizing the basic group theoretic concepts and theorems.

Class Time

There will be three hours of class lecture each week.

Lecture Times
MWF 11:45–12:45 Chapman 107

Office Hours

I will schedule 3 hours a week of formal office hours. These times will be chosen after consulting with my classes. I will post the times on my website and outside my office door. I have an open door policy; if I'm in my office and my door is open, please feel free to drop by with questions. You are also welcome to schedule a meeting outside of my formal office hours by sending me an email.

Homework

There will be a homework assignment due roughly every week. We will decide together on the first day of class on a good day of the week for your homework to be due. Each week's assignment and due date will be announced in class and will be posted on my web page. After your homeworks have been graded, I will post solutions on my web page. I will accept late homework, but there will be a 10% deduction for each day the homework is handed in after its due date.

Midterms

There will be one in-class midterm exam. It is tentatively scheduled to be held on Monday, March 21. We will finalize the date during the first week of class.

Final Exam

There will be a two-hour final exam on Wednesday, May 11. It will be held from 10:15am to 12:15pm at a location to be announced later. The exam will be designed to be good practice for prelims. There will be a range of questions from standard to hard to challenging, and you will not be expected to complete all the questions to do well on the exam.

Evaluation

Course grades will be determined as follows:

Homework	40%
Midterm	30%
Final	30%

Letter grades will be assigned according to the following scale. This scale is a guarantee; I also reserve the right to lower the thresholds.

A	90–100%
B	80–89%
C	70–79%
D	60–69%
F	0–59%

Tentative Schedule

This schedule may be updated as the semester progresses. Each week's readings will be announced on my web page.

Week	Topics and Events
1/21	Topologies (Section 12)
1/24 – 1/28	Bases, example topological spaces, closed sets (Sections 13, 14, 16, 17)
1/31 – 2/4	Convergence, continuity, manifolds (Sections 17, 18)
2/7 – 2/11	New topological spaces from old (Sections 19, 21)
2/14 – 2/18	Connectedness and compactness (Sections 23, 24, 26)
2/21 – 2/25	More on compactness, nets (Sections 26–29)
2/28 – 3/4	Topological vector spaces, countabliliy and separation axioms (Sections 30, 31)
3/7 – 3/11	Normal spaces, Urysohn Lemma (Sections 32, 33)
3/14 – 3/18	Spring Break
3/21 – 3/25	Tietze Extension Theorem, Urysohn Metrization Theorem (Sections 33, 35) Monday: Midterm Exam
3/28 – 4/1	Axiom of Choice, Zorn's Lemma, Tychonoff Theorem (Sections 34, 38)
4/4 – 4/8	Homotopy, fundamental group, homotopy equivalence (Sections 51, 52, 58)
4/11 – 4/15	Retractions, fundamental group of the circle and some other spaces (Sections 55, 54, 59)
4/18 – 4/22	Covering spaces and the covering group. (Sections 53, 79)
4/25 – 4/29	Universal covering spaces and the classification theorem (Sections 80, 82)
5/2 – 5/6	Classification theorem continued
5/11	Final Exam

Rules and Policies

Collaboration You are encouraged to work together in solving homework problems. But each student must write up his or her own solutions independently. If you receive significant help solving a problem, it is customary to make a note in your homework to give the person who helped you credit.

Makeup Exams You can make up an exam if certain extenuating circumstances prevent you from taking it and if you inform me in advance. Contact me as soon as possible if you are going to miss an exam.

Attendance Attendance is not included directly as part of your grade.

Cell Phones Turn off your cell phone before you come to class.

Disabilities Services I will work with the Office of Disabilities Services (203 Whitaker, 474-7043) to provide reasonable accommodation to students with disabilities.

Incomplete Grade Incomplete (I) will only be given in Computer Science, Mathematics or Statistics courses in cases where the student has completed the majority (normally all but the last three weeks) of a course with a grade of C or better, but for personal reasons beyond his/her control has been unable to complete the course during the regular term. Negligence or indifference are not acceptable reasons for the granting of an incomplete grade. (Note: this is essentially the old University policy.)

Late Withdrawals A withdrawal after the university deadline from a Department of Mathematical Sciences course will normally be granted only in cases where the student is performing satisfactorily (i.e., C or better) in a course, but has exceptional reasons, beyond his/her control, for being unable to complete the course. These exceptional reasons should be detailed in writing to the instructor, department head and dean.

Academic Dishonesty Academic dishonesty, including cheating and plagiarism, will not be tolerated. It is a violation of the Student Code of Conduct and will be punished according to UAF procedures.